MARKET VALUE VERSUS AGRICULTURAL USE VALUE OF FARMLAND

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Market Value versus Agricultural Use Value of Farmland

Introduction

The value of farmland is an important component of the balance sheet of the farming sector and in determining opportunity costs of farmland investments in cost of returns studies. Therefore, the data that are used to estimate farmland values used in balance sheet estimates and implicitly in cost of returns studies are also important and if there are problems in farmland values and rent data, they should be addressed. In fact, there are problems with these data, at least in the way they are frequently used.

One problem of these data is that the assumption is frequently made that the reported value of farmland is equal to the discounted present value of cash returns from farmland's use in agriculture, its agricultural use value. A related assumption is that agricultural cash rents reflect the value of the services generated by farmland.

Several factors may contribute to the divergence between farmland's agricultural use value and its market value. One factor may be that farmland's most profitable use in the future may be in producing nonagricultural services. Using farmland for housing developments, recreational activities, roads, land fill sites, etc. may in the future earn returns greater that those available from farmland's use in agriculture; when this is true, farmland's current value will not be reflected accurately by its agricutural use value.

Government payments associated with the control of farmland may also contribute to the divergence of farmland's market value from its agricultural use value. Farmland retirement and conservation payments, subsidized credit, payment for adopting farmland conservation practices, or receiving payments to maintain or improve the quality of farmland's future services are examples of government payments tied to the control of farmland but not necessarily associated with the production of agricultural products. In many cases, farmland subsidies require eligible

participants to have established a record of agricultural production involving farmland resources. In these cases, an established record of farmland use in agricultural production, like taxi cab medallions or milk marketing permits, may have capitalized value independent of what is produced on the farmland.

Farmland's market value may also diverge from its agricultural use value because it simultaneously earns returns (and may suffer costs) in addition to those associated with agricultural production. Sources of income from farmland besides agricultural production may include recreational payments, mineral extraction revenues, and site value payments. Costs independent to agricultural production may include pollution abatement payments, insurance, maintenance, and the costs of meeting specific ordinances related to having agricultural farmland near urban centers. Tax policies of state and local governments may also affect the value of farmland. In addition, natural features of the farmland such as topography, fertility, and rainfall in the area affect the amount of other resources required to produce a crop and consequently how much tenants can afford to pay to acquire the use of farmland.

Finally, farmland's market value may exceed it agricultural use value because of what are now called speculative bubbles. Simply stated, speculative bubbles may increase the value of farmland because farmland owners and prospective buyers incorrectly infer from past experiences the future earnings stream from farmland and consequently, farmland's future value. In the presence of speculative bubbles farmland may be overpriced simply because the future is hard to predict.

Agricultural Use versus Market Value

There are several reasons why it is important to separate farmland's agricultural use value from its market value. Many states have enacted laws that encourage the use of farmland

for agricultural purposes near urban centers. To do so, farmland used in agricultural production near urban centers is assessed for tax purposes at its (lower) agricultural use value rather than its (higher) market value. In these instances, there is a need to distinguish between the agricultural use value of farmland and the market value of farmland.

Another reason for separating farmland's agricultural use value from its market value is to better understand and interpret the relationships between the market value of farmland and agricultural rents from farmland. Without such information, the farmland value to agricultural rent ratio of 94 in New Jersey and 13 in North Dakota in 1977 seems out of line.[1]

We assume that knowing the agricultural use and agricultural returns from farmland is important. Unfortunately, the current USDA data series do not provide the information required to estimate the agricultural use value of farmland. How to find the agricultural value of farmland from market data is the focus of the remainder of this paper. In what follows, the origins of commonly used farmland value and agricultural rent data are discussed as well as other data series and issues. Then we review the literature that has estimated the market value of agricultural farmland. Then a model is deduced that will permit us to obtain estimates of the importance of agricultural income in the determination of farmland's market value. Finally, we summarize our results.

Agricultural Farmland Value and Rent Data Series

The U.S. Department of Agriculture data series for average farmland and buildings values and average cash rent values for farmland and buildings for selected states are used in this study. These values come from the Agricultural Land Values Survey, which is a voluntary survey of farm operators' opinions about farmland values (Barnard and Hexem). This means

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[1]See Table 1 in Robison, Lins, and VenKataraman.

that surveys represent the farmer's perceived value rather than an identifiable transaction value. Without an assumption that the survey respondents have access to complete information, their opinions and hence values stated will be biased with respect to actual transaction values, especially during periods of rapidly changing values.

The opinion survey of farm operators may introduce bias into the data in other ways. One possibility might be the survey's design. By polling only farmers the sample design ignores nonfarmer owners who purchase roughly 30 percent of all farmland each year. The value of farmland for nonagricultural purposes, such as recreation, which may be important to nonfarmer owners, is thus systematically ignored. Moreover, because the sample design tends to select large farmers located in rural areas there is likely an underreporting of higher farmland values reported near urban centers and by small and hobby-sized farmers.

To demonstrate the difference in farmland value estimates resulting from sample design, Figure 1 compares USDA's estimates of agricultural farmland's market value with those obtained at the University of Minnesota. The University of Minnesota has collected information of rural farmland for over 80 years. Data for their farmland value estimates are obtained from brokers, appraisers, farm managers, insurance agents, bank officers, country officials and others familiar with their respective areas (Govindan and Raup). Figure 1 shows that USDA values were consistently below estimates obtained at the Univeristy of Minnesota from 1972 until the early 80's and then was consistently higher than University estimates after the early 80's.

In part, this consistent deviation of USDA and University farmland value estimates can be attributed to differences in U.S. Census farmland value estimates and University of Minnesota estimates. USDA survey results are calibrated to Census of Agriculture data and thus differences between U.S. Census and University estimates will create differences between

USDA's and University estimates. in 1987, the US. Census of Agriculture estimated the value of Minnesota farmland to be $700. The University's estimate was $523 in 1988.

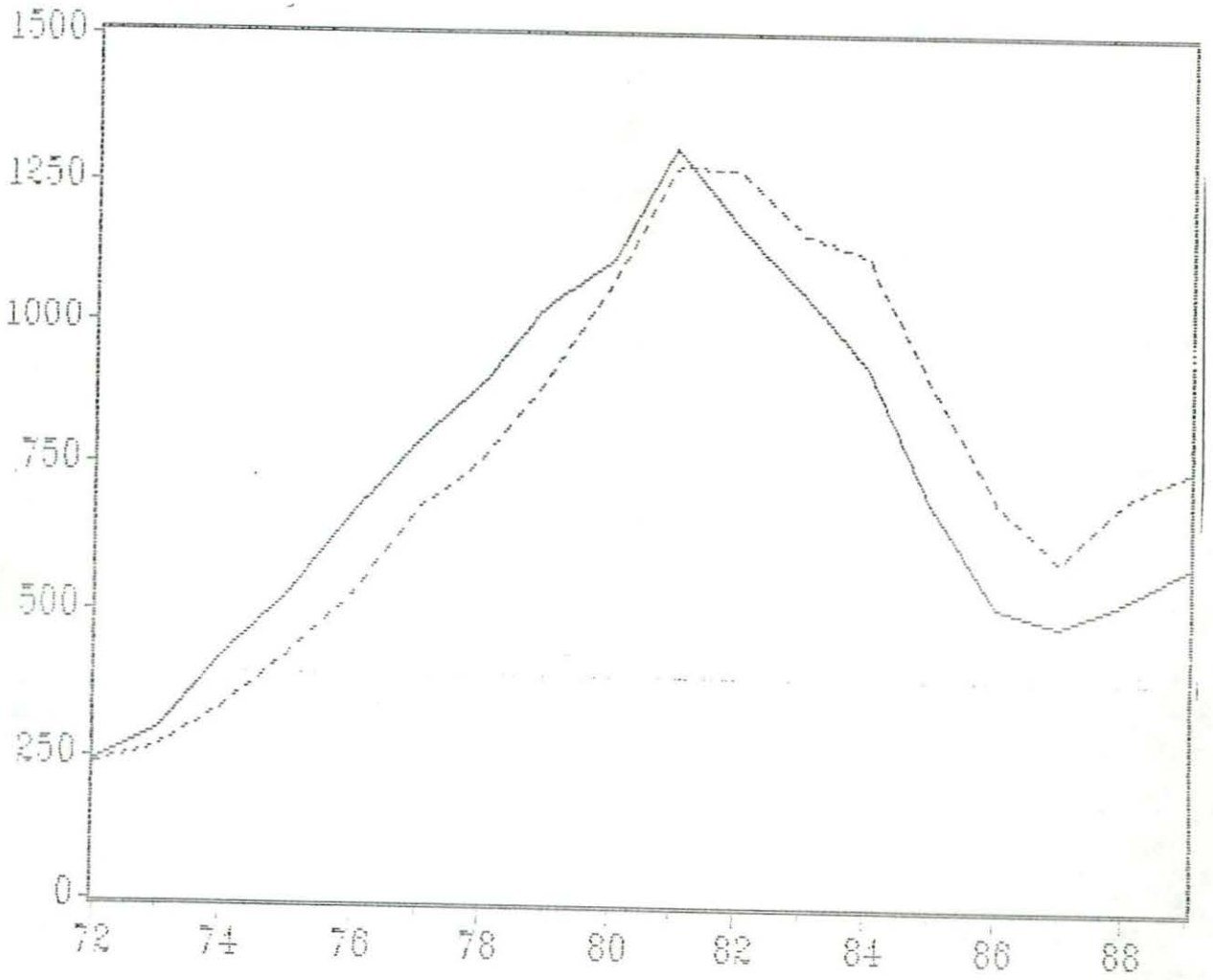

Figure 1.

A Comparison of Agricultural Farmland's Market Value in Minnesota Estimated by USDA (solid line) and University of Minnesota (dash line)

Another possible source of bias USDA's estimate of farmland values could result from efforts to calibrate the survey data with Census of Agriculture benchmark surveys. Farmland values from the Agricultural Land Value Survey are benchmarked every five years to Census of Agriculture survey data. Intercensus years are extrapolated forward and are then recalibrated when new Census benchmark values become available. The recalibration methodology has recently changed, raising the concern that the earlier data series using the old methodology are not valid. Irregardless of which calibration method can be best defended, the data series are no longer consistently estimated.[2] Also, Kuchler and Burt suggest that intercensus estimates derived from USDA's survey typically underestimate Census values when nonfarm demands for farmland are relatively strong because of the bias in the sampling.

There are other concerns about the calibration of USDA data to Census of Agriculture data. One concern is that the calibration of the surveys is influenced by the differences in sample design. The Census targets a much larger owner population (including urban areas and small farmers), is mandatory, and is statistically reliable to the county level. Conversely, the USDA farmland survey targets large farm operators in rural locations, is voluntary, and is designed to produce aggregate state-level estimates. Moreover, the timing of the USDA survey has been changing, recently from moving April 1, to February 1, and now to January 1. Changing of the timing of the survey raises additional concerns about the consistency of the data.

Using the per acre cash rent of farms and farmland value series to model farmland markets raises still other concerns. Cash rent values reflect an opportunity cost to the farm operator, but may be more reflective of the return to land experience by nonfarmer owners.

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[2]Beginning with 1984 intercensus, values are determined using a geometric interpolation method instead of an additive interpolation method.

Another concern is that cash rents may not be the only source of income. Nonfarm owners may attach site value to the farmland or may receive income for allowing part of their farmland to be used for recreational purposes. Finally, it is not clear if part of the rents are payments for the use of buildings or if these payments in some cases are separate from the rents paid for the use of bare farmland. These concerns and others lead us to conclude that cash rents are systematically biased estimates of the returns from farmland's agricultural service payments.

In 1984, the methods used to estimate the cash rent series began to change. Before 1984, a panel of farmers were surveyed annually to obtain their opinion about the average cash rent and average value of rented farmland in their "locality." Now a stratified random sample is selected from the same overall population as the farmland and building value series uses. Beginning in 1989, the ambiguity of "locality" was resolved by asking for average cash rent values within a county. Cash rent values from the survey are not benchmarked to Census data like the estimates of farmland value are.

The farmland market is really a collection of many very different local markets. How representative aggregations of average local values to average state levels depends critically on the weighing scheme employed to create the farmland values series, as well as the assumptions made about the portion of farmland's value attributable to the value of buildings.

Models employing state generated data for farmland values may provide alternatives to USDA supplied data. Studies by Burt and Scott are examples of such models using state data. But not all states collect separate data and even among these will be methodological differences in data series generation.

Other Data Series

Proxies for variables used to separate agricultural farmland values and nonagricultural value from market value are not readily available. Estimates of nonfarm income influences can be proxied by a state level series available from USDA, but it comes with caveats for this application. For example, the series is an estimate of off-farm cash income for principal farm operators and thereby likely underestimates the influence that nonfarm income of small or hobby farmers might have on land's value. Moreover, the series is not designed to capture the nonfarm investor's income. Per capita personal income measures are available but may be too broad a measure for this application.

USDA tabulates a government payments series for farm commodity programs and other farm program purposes. The data series reports gross direct government payments to the farm sector and is available at the state level.

A number of alternative series can be used to proxy the opportunity cost of capital. An annual series of Federal Land Bank interest rates compiled by the Farm Credit Administration until 1989 provides one option. This is desirable over other series, such as U.S. Treasury rates, because of the Federal Land Bank's dominance in farm real estate finance. However, the series is not available at the state level and may understate the true opportunity cost of renting farmland.

In addition to the data series issues already discussed are concerns about structural factors that influence land valuation and land returns and for which better data are needed. Preferential treatment of farmland on property tax assessments is an example. At the end of 1985, 49 states allowed the preferential treatment of farmland, 27 states had these coupled with deferred taxes which are imposed when the farmland is converted to a nonqualifying use, and 6 offered programs providing tax concessions in exchange for restrictions on farmland use (Grillo

and Seid). Local suburban governments in some states have begun to offer their own tax concession programs, often referred to as Greenbelt laws.

Another example of structural factors influencing farmland valuation is the limits on the ownership of farmland. These limits may affect the demand for farmland and hence its value. There is little empirical evidence of the effect on the market value of farmland of these limits. At the end of 1986, Schian and Seid report that 29 states had limits on foreign ownership of farmland and 15 states restricted business entities from owning farmland or engaging in the business of farming.[3]

Finding the Market Value of Farmland: A Review of Literature

The importance of farmland in the farm sector's balance sheet has made it a popular focus of many research efforts. The most remarkable feature about these studies, however, is their lack of consensus. Perhaps inaccurate data series have contributed to the lack of consensus. An alternative explanation is that the lack of consensus can be attributed to misinterpreation of the data in which researchers have failed to distinguish between farmland's market value and farmland's agricultural use value.

All of the studies reviewed here attempt to estimate farmland's market value, sometimes failing to recognize that agricultural income may not be adequate to explain agricultural farmland's market value. A sample of such studies include the following.

Reynolds and Timmons, Tweeten and Martin, and Herdt and Cochrane use simultaneous equation models of supply and demand for farmland. Factors affecting farmland values suggested from these studies included: expected capital gains, government payments for

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[3]See Melichar and Burt for additional discussion of the biases that result from using aggregate data.

farmland diversion, conservation payments, farm enlargements, and technological progress. Klinefelter used a simple linear model emphasizing the importance of capitalized agricultural rents in determining agricultural farmland's value. For these models, however, Pope et al. found that, "when recent data were added to the sample, numerous changes in signs of coefficients occurred for all of the simultaneous equations models. Further, most of the estimated coefficients were not statistically significant from zero."

Robison, Lins, and VenKataraman concluded that most farmland model specifications do not reflect accurately enough the relevant structural changes occurring in the farmland market. In an effort to model structural changes in the farmland market, they deduced a model in which farmland values were determined by the capitalized value of agricultural rents and nonagricultural returns to farmland in a two-sector farmland model. While they found some support for the importance of nonagricultural returns on farmland values, they also found considerable difference between states.

Castle and Hoch concluded that expected capitalized rent and expected capital gains are the critical components determining farmland values. Featherstone and Baker criticized the Castle and Hoch study because capital gains can only result from capitalizing a growing income stream. Phipps, on the other hand, concluded from his study that farm-based returns unidirectionally change farmland values. Meanwhile, Burt demonstrated the link between rents and farmland values in Illinois approximating a capitalization formula using a second-order rational distributed lag on farmland rents.

In another study, Scott lists factors affecting the decline in farmland values, emphasizing the increasing ratio of debt servicing required relative to cash rents. Shalit and Schmitz concluded savings and accumulated real estate debt are important determinants of farmland

prices. Meanwhile, Reinsel and Reinsel reaffirm the importance of farm income in the determination of farmland values.

Recently, modelers have discovered still another factor influencing farmland values about which they can disagree, speculative or rational bubbles. A speculative bubble is essentially an overreaction to current price information. Bubbles suggest that because of overreaction to current price information, market corrections will be required later and the market participants will find their expectations unfulfilled. The findings of DeBondt and Thaler, and Grossman and Shiller, are that the stock market has greater price variance than one would expect without price bubbles. Featherstone and Baker reached a similar conclusion regarding real estate values that have a tendency to exhibit bubbles. Moreover, high returns in 1973 and 1974 set off a boom-bust cycle in part caused by an overreaction to prices. Falk, on the other hand, found no evidence of speculative bubbles in Iowa farmland prices. But a working paper by Baffes and Chambers supports the conclusions of Featherstone and Baker using a different methodology. In contrast, Tegene and Kuchler concluded that there is no evidence to support the hypothesis that speculative bubbles contribute to farmland prices.

These conflicting results, unfortunately, do not help us decide the question raised earlier: what is the agricultural value for farmland? In fact, the results leave us questioning if there is anything approaching a consensus about what determines the market value of farmland. Nevertheless, there is perhaps still another approach that might allow us to examine the competing contentions in a new framework. The new framework requires that we place more confidence in our economic theory than in statistical routines that process often mediocre data.

Present Value Models

Assume that farmland produces a stream of cash flows from agricultural activities of R_t, R_{t+1}, R_{t+2}, ... in periods t, $t+1$, $t+2$, ... Moreover, assume that the opportunity costs of capital between periods t, $t+1$, $t+2$, ... equal r_t, r_{t+1}, r_{t+2}, ... The present value of the future returns from agricultural activities generated from the farmland can be written as:

$$V_{t-1}^{a} = \frac{R_t}{(1+r_t)} + \frac{1}{(1+r_t)}\left[\frac{R_{t+1}}{(1+r_{t+1})} + \frac{R_{t+2}}{(1+r_{t+1})(1+r_{t+2})} + \cdots\right] \tag{1}$$

and V_t^a can be written as:

$$V_t^{a} = \frac{R_{t+1}}{(1+r_{t+1})} + \frac{R_{t+2}}{(1+r_{t+1})(1+r_{t+2})} + \cdots \tag{2}$$

Substituting V_t^a for the bracketed expression in equation (1), we can solve for V_t^a and write:

$$V_t^{a} = (1+r_t)\, V_{t-1}^{a} - R_t \tag{3}$$

Suppose there is another stream of cash income Q_t, Q_{t+1}, Q_{t+2}, ... produced by the farmland for periods t, $t+1$, $t+2$, ... whose present value is:

$$V_t^{0} = (1+r_t)\, V_{t-1}^{0} - Q_t \tag{4}$$

Then the market value of farmland V_{t-1} can be expressed as:

$$\begin{aligned} V_t &= V_t^{a} + V_t^{0} \\ &= V_{t-1}(1+r_t) - R_t - Q_t \end{aligned} \tag{5}$$

The challenge is to find $\lambda_t = V_t^a/V_t$, the proportion of the farmland's value attributable to agricultural activites. To do so, we find estimates for Q_t. This series, an estimate of nonagricultural rents, can be obtained from (5) and is equal to:

$$Q_t = V_{t-1}\,(1+r_t) - R_t - V_t \qquad (6)$$

Since the market value of farmland V_{t-1}, proxies for r_t, and agricultural rent R_t, are observed, we can indeed solve for Q_t. Our estimates, however, are likely to underestimate Q_t for the following reason. First, the proxy for r_t, the average Federal Land Bank's interest rate, is usually lower than the true opportunity cost of renting farmland. One explanation is the difference in risk. A second reason for the underestimate of Q_t is that R_t, a proxy for cash returns to farmland, are usually an overestimate of the return to the landlord. Insurance, some maintenance and supervision costs as well as property and income taxes all reduce the realized rents from farmland. By omitting these costs from our estimates of Q_t, we again systematically underestimate Q_t.[4]

We assume that the relationship in (5) described the market determined relationships between the market value for farmland and rents from farmland. If we add the following assumptions that

$$Q_t = (1+h_t)\,Q_{t-1} + \epsilon \qquad \textit{where} \quad \epsilon_t \sim (0,\ \sigma_\epsilon)\ ,$$

$$R_t = (1+g_t)\,R_{t-1} + v \qquad \textit{where} \quad v_t \sim (0,\ \sigma_v)\ ,$$

$$(1+g_t)\ /\ (1+r_t) = k_1\ ,$$

and

$$(1+h_t)\ /\ (1+r_t) = k_2$$

for t, then (5) can be written as:

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[4]Other evidence that R_t is an overestimate can be demonstrated by discounting actual R_t by actual $(1+r_t)$. In most cases, the discounted flow exceeds V_{t-1} by a significant amount for even over a relatively short period of 10 to 15 years.

$$E\left(V_{t-1}\right) = \left[\frac{R_{t-1}(1+g_t)}{(1+r_t)} + \frac{R_{t-1}(1+g_t)(1+g_{t+1})}{(1+r_t)(1+r_{t+1})} + \ldots \right] + \left[\frac{Q_{t-1}(1+h_t)}{(1+r_t)} + \frac{Q_{t-1}(1+h_t)(1+h_{t+1})}{(1+r_t)(1+r_{t+1})} + \ldots \right]$$

$$= \alpha_o R_t + \beta_o Q_t \tag{7}$$

where α_o and β_o are constant capitalization factors.

To estimate α_o and β_o, the right-hand side of (6) is substituted into equation (7) in place of Q_t. Then we can write:

$$E(V_{t-1}) = \alpha_o R_t + \beta_o \left[V_{t-1}\,(1+r_t) - R_t \right] \tag{8}$$

and solving for V_t, we obtain the equation which is estimated statistically, which equals:

$$V_t = \left[\frac{\alpha_o - \beta_o}{1 + \beta_o} \right] R_t + \left[\frac{\beta_o}{1 + \beta_o} \right] V_{t-1}\,(1+r_t) \tag{9}$$

$$= \hat{a}\, R_t + \hat{b}\, V_{t-1}\,(1+r_t)$$

Our statistical estimates of $\hat{a}$ and $\hat{b}$ are reported in Table 1 along with their respective t statistics. Calculations of $\hat{\beta}_o = \hat{b}/(1-\hat{b})$ and $\hat{\alpha}_o = \hat{a}(1+\hat{\beta}_o)+\hat{\beta}_o$ are reported in Table 2.

Finally, armed with estimates of α_o and β_o, we can estimate V_t^a/V_t as:

$$V_t^a \;/\; V_t = \alpha_o R_t \;/\; V_t \tag{10}$$

Our estimates of equation (9) are reported in Table 1. Our calculations of λ_t are reported in Table 3.

Table 1. Empirical Results of Land's Market Value Estimates, by State, 1951-86

State	Regression Coefficients					
	Ag. Rents (t-Statistic)		Nonag. Rents & Govt. Payments (t-Statistic)		AR (1)[1] (t-Statistic)	
NJ	4.54	(1.37)	.84	(37.81)	.85	(8.82)
DE	20.17	(4.81)	.25	(3.93)	.81	(8.35)
MD	25.44	(4.64)	.34	(5.18)	.77	(7.01)
PA	28.02	(6.71)	.24	(8.18)	.90	(11.39)
MI	15.40	(9.20)	.28	(10.50)	.89	(11.29)
WI	10.97	(5.34)	.34	(8.94)	.89	(10.64)
MN	14.66	(7.62)	.07	(1.07)	.81	(8.54)
OH	24.86	(2.40)	-.23	(-2.57)	.66	(5.19)
IN	16.45	(8.83)	.006	(.087)	.77	(7.17)
IL	20.84	(6.59)	-.24	(-1.89)	.73	(6.46)
IA	21.40	(6.16)	-.35	(-2.37)	.75	(6.93)
MO	16.62	(10.91)	-.015	(-.31)	.82	(8.31)
ND	12.40	(7.56)	.11	(2.00)	.80	(7.85)
SD	11.36	(8.24)	.166	(3.31)	.80	(8.06)
VA	1.62	(1.34)	.90	(27.23)	.56	(3.74)
NC	4.48	(2.83)	.75	(17.33)	.69	(5.45)
KY	5.55	(5.24)	.65	(29.57)	.88	(10.34)
TN	6.95	(4.26)	.61	(20.49)	.89	(10.88)
SC	11.91	(3.82)	.60	(25.45)	.94	(13.49)
GA	7.49	(5.46)	.67	(24.81)	.82	(7.93)
MS	6.93	(4.34)	.61	(10.39)	.64	(4.76)
AR	14.89	(4.87)	.21	(4.52)	.91	(12.32)

[1] Autoregressive lag of one period used to correct autocorrelation.

Table 2. Calculated Values of Capitalization Factors α_0 and β_0, by State, Using 1951-86 Data

State	Capitalization Factor for Agricultural Income (α_0)	Capitalizatized Factor for Nonagricultural Income (β_0)
NJ	7.07	.46
DE	24.40	.20
MD	32.15	.25
PA	33.64	.19
MI	18.99	.22
WI	14.01	.25
MN	15.68	.065
OH	17.14	-.30
IN	16.55	.006
IL	13.94	-.32
IA	9.34	-.54
MO	16.35	-.015
ND	13.73	.10
SD	13.12	.14
VA	2.86	.47
NC	6.83	.43
KY	8.13	.39
TN	9.96	.38
SC	16.75	.38
OA	10.90	.40
MS	9.93	.38
AR	17.65	.17

Table 3. Percentage of Agricultural Land's Market Value Attributed to Agricultural Rents, by State, 1960-86

Year	State																					
	NJ	DE	MD	PA	MI	WI	MN	OH	IN	IL	IA	MO	ND	SD	VA	NC	KY	TN	SC	GA	MS	AR
1960	20	115	143	170	138	181	139	87	113	91	63	128	122	134	22	77	96	103	137	140	113	215
1961	22	132	141	153	134	167	145	91	118	95	66	136	113	144	25	88	96	104	131	131	104	193
1962	18	139	114	159	134	163	142	88	119	91	68	124	123	124	21	83	103	104	129	140	114	194
1963	18	144	94	152	130	183	142	93	119	93	69	136	114	123	20	86	110	97	135	130	104	213
1964	18	129	109	143	129	171	149	91	119	91	69	140	112	130	19	82	82	97	137	146	101	197
1965	15	143	105	140	129	166	148	89	118	91	69	123	118	131	20	77	78	102	137	148	105	172
1966	14	131	103	147	130	172	156	93	131	92	72	130	115	126	19	73	85	105	127	148	104	156
1967	14	116	84	143	141	156	150	86	113	92	69	121	117	112	17	67	96	85	121	123	97	140
1968	16	121	90	136	119	153	158	91	116	99	72	116	128	117	15	61	85	87	112	118	121	148
1969	13	125	83	125	97	148	150	87	117	97	76	126	123	127	14	53	77	70	109	113	75	124
1970	14	114	76	107	91	142	150	89	120	101	78	122	130	125	14	47	73	67	94	96	70	121
1971	14	104	75	116	114	136	149	93	122	104	79	125	126	127	16	50	76	67	102	101	64	143
1972	11	91	79	134	100	123	131	101	126	98	79	134	124	121	12	48	78	64	102	101	67	169
1973	11	84	71	123	92	112	123	93	120	97	77	119	123	120	11	42	73	57	90	89	71	143
1974	12	81	67	103	93	108	129	88	116	94	81	123	134	116	11	42	73	56	87	83	69	140
1975	10	73	62	97	96	114	128	92	129	93	76	118	128	108	8	40	65	53	74	75	61	124
1976	8	71	59	96	96	108	126	92	121	89	70	110	138	112	10	36	64	52	72	70	56	122
1977	8	71	64	87	87	108	110	83	108	77	58	104	117	130	12	38	70	48	72	74	58	117
1978	8	75	55	84	81	98	99	83	97	73	58	103	117	115	10	31	56	47	65	70	54	108
1979	8	68	66	78	78	87	94	79	88	69	54	100	101	103	8	34	51	39	67	57	47	105
1980	9	67	58	72	79	79	86	71	83	68	49	92	90	101	7	25	49	38	59	53	45	98
1981	9	72	55	76	75	76	78	74	82	67	48	87	89	97	7	25	45	37	55	48	40	85
1982	10	79	64	84	75	83	84	85	90	78	52	91	82	87	8	24	46	39	49	41	33	82
1983	12	76	80	87	80	90	92	89	97	85	59	95	84	89	7	25	43	36	46	44	31	71
1984	11	81	78	85	85	94	97	89	99	86	65	95	88	88	6	27	43	36	52	45	39	85
1985	10	97	84	84	79	100	105	102	114	105	84	110	95	76	6	26	37	34	49	41	35	86
1986	11	93	83	88	82	93	119	99	117	113	89	106	105	98	7	22	44	40	45	38	29	84

Given that our estimates of Q_t are likely underestimated, we are not surprised that many estimates of λ_{t-1} exceed 100. Nevertheless, the relative importance of our λ_{t-1} estimates is important and consistent with our intuition. For example, in New Jersey agricultural rents account for less than 20 percent of farmland's market value while in Indiana the agricultural value of farmland is nearly equal to the market value of farmland.

It is possible, of course, to attempt to find an instrument for Q_t. It is expected that Q_t is a function of government commodity payments, G_t, and nonfarm income, NF_t. To test this relationship we perform the regression, $Q_t = \gamma_o G_t + \gamma_1 NF_t$, reported in Table 4. We have particular interest about the significance of government payments. In several states, government payments have been insignificant, while in others, particularly important agricultural states, the influence of G_t on farmland values is significant.

To find that portion of agricultural farmland's market value attributed to government payments, Table 5 is calculated based on the equation:

$$\lambda^{G}_{t-1} = \gamma_o \beta_o G_t / V_{t-1}$$

where λ^{G}_{t} is the portion of farmland's market value attributed to government payments.

Table 4. Empirical Results of Nonagricultural Incomes and Government Payments Estimates, by State, 1960-86

State	Regression Coefficient							
	Constant (t-Statistic)		Govt. Payments (t-Statistic)		Nonagricultural Income (t-Statistic)		AR ( )[1] (t-Statistic)	
NJ	-251.76	(-4.23)	.02	(4.45)	.030	(2.78)	.44	(2.01)
DE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	.63	(2.60)
MD	-141.80	(-2.04)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
PA	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
MI	-90.09	(-3.86)	.001	(4.19)	n.s.	n.s.	n.s.	n.s.
WI	-67.33	(-3.61)	.001	(4.53)	n.s.	n.s.	n.s.	n.s.
MN	-67.36	(-3.80)	.0007	(7.31)	-.008	(-2.34)	n.s.	n.s.
OH	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	.84	(5.70)
IN	n.s.	n.s.	.0009	(2.45)	n.s.	n.s.	.52	(2.27)
IL	-136.05	(-2.44)	.0005	(3.17)	n.s.	n.s.	n.s.	n.s.
IA	n.s.	n.s.	.0005	(4.70)	-.016	(-2.77)	n.s.	n.s.
MO	-102.43	(-3.79)	.0006	(2.88)	n.s.	n.s.	n.s.	n.s.
ND	-24.08	(-3.30)	.0002	(6.07)	n.s.	n.s.	n.s.	n.s.
SD	-21.71	(-2.86)	.0003	(3.62)	n.s.	n.s.	n.s.	n.s.
VA	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	.54	(2.80)
NC	-115.60	(-3.39)	n.s.	n.s.	.013	(3.10)	n.s.	n.s.
KY	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	.91	(8.14)
TN	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	.83	(5.92)
SC	-96.45	(-2.50)	n.s.	n.s.	.013	(2.33)	.69	(4.50)
GA	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	.83	(5.62)
MS	-93.36	(-2.91)	.0008	(3.82)	n.s.	n.s.	n.s.	n.s.
AR	-49.84	(-3.73)	.0009	(8.23)	n.s.	n.s.	n.s.	n.s.

[1] Autoregressive lags of periods one to three used to correct autocorrelation.

Table 5. Percentage of Agricultural Land's Market Value Attributed to Government Payments, by State, 1960-86

Year	State																					
	NJ	DE[1]	MD[1]	PA[1]	MI	WI	MN	OH[1]	IN	IL	IA	MO	ND	SD	VA[1]	NC[1]	KY[1]	TN[1]	SC[1]	GA[1]	MS	AR
1960	6	0	0	0	11	7	9	0	4	21	2	9	13	10	0	0	0	0	0	0	5	8
1961	12	0	0	0	22	15	22	0	16	12	13	33	14	16	0	0	0	0	0	0	7	8
1962	14	0	0	0	27	15	24	0	16	13	16	34	23	19	0	0	0	0	0	0	7	9
1963	13	0	0	0	20	17	27	0	14	12	16	26	24	20	0	0	0	0	0	0	7	7
1964	13	0	0	0	22	17	31	0	15	15	23	29	31	21	0	0	0	0	0	0	8	6
1965	13	0	0	0	27	17	33	0	18	15	22	33	31	23	0	0	0	0	0	0	9	6
1966	12	0	0	0	30	17	32	0	15	12	20	36	35	23	0	0	0	0	0	0	37	28
1967	10	0	0	0	25	12	21	0	11	9	12	27	31	18	0	0	0	0	0	0	38	31
1968	10	0	0	0	27	14	28	0	17	13	19	30	31	22	0	0	0	0	0	0	30	24
1969	9	0	0	0	29	14	33	0	18	15	19	31	33	22	0	0	0	0	0	0	30	22
1970	7	0	0	0	24	12	28	0	16	12	16	28	31	20	0	0	0	0	0	0	30	22
1971	4	0	0	0	28	8	20	0	13	13	14	20	26	17	0	0	0	0	0	0	24	19
1972	6	0	0	0	21	11	31	0	18	18	21	25	37	24	0	0	0	0	0	0	24	20
1973	3	0	0	0	12	6	16	0	10	10	12	14	21	15	0	0	0	0	0	0	19	14
1974	1	0	0	0	3	2	2	0	1	1	1	3	5	7	0	0	0	0	0	0	1	1
1975	1	0	0	0	3	2	3	0	1	2	2	4	3	5	0	0	0	0	0	0	3	2
1976	1	0	0	0	2	2	5	0	0	0	1	3	2	11	0	0	0	0	0	0	3	1
1977	1	0	0	0	4	2	5	0	1	1	1	4	9	11	0	0	0	0	0	0	3	7
1978	2	0	0	0	7	3	9	0	2	3	6	5	17	12	0	0	0	0	0	0	3	3
1979	1	0	0	0	1	2	3	0	1	1	1	2	3	4	0	0	0	0	0	0	1	3
1980	1	0	0	0	2	1	3	0	0	1	1	4	6	5	0	0	0	0	0	0	1	3
1981	1	0	0	0	2	1	3	0	1	1	1	5	6	6	0	0	0	0	0	0	1	3
1982	1	0	0	0	4	2	6	0	2	2	3	3	8	5	0	0	0	0	0	0	5	7
1983	3	0	0	0	15	8	22	0	10	10	13	10	21	14	0	0	0	0	0	0	10	16
1984	5	0	0	0	16	11	20	0	11	11	11	10	18	12	0	0	0	0	0	0	8	13
1985	3	0	0	0	11	8	22	0	9	10	12	9	18	12	0	0	0	0	0	0	10	21
1986	4	0	0	0	2	17	48	0	20	24	28	17	32	24	0	0	0	0	0	0	10	21

[1] Not significant.

Summary and Conclusions

This paper has suggested that one difficulty with our use of farmland value and rent data is that we fail to separate agricultural use value and market value of farmland. Moreover, most empirical studies attempt to explain the market value of agricultural farmland by considering only agricultural sources of income.

This paper attempted to obtain an instrument for rents and costs that affect farmland's market value and that are not included in the agricultural rent series. The good news is that if one is willing to assume perfect market conditions prevail, such an instrument is easily obtained. The bad news is that once obtained, it is not clear how to use that data to find the portion of farmland's agricultural values. The methods we used in this paper are the same ones employed in other studies (i.e., capitalized income approach), but nevertheless they have serious economic difficulties.

Still the result of this study points out what must be obvious to most: that there is an increasing divergence of agricultural farmland's market value from its agricultural use value. Moreover, this divergence should be accounted for before we conduct and publish more studies that attempt to predict and diagnose agricultural farmland's market values.

Finally, it goes without saying, that the USDA agricultural farmland values and agricultural rents data may have biases that limit the data's usefulness in conducting farmland market studies. Perhaps one solution to this difficulty is to supplement USDA data with University farmland value data series such as those available in Minnesota, Illinois, Nebraska, and Iowa.

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